US Army Medical Research and Materiel

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Flow-Through Cell Culture Chamber

This invention is a simple, efficient flow-through cell culture chamber for use in light and fluorescent microscopy. The chamber provides a way to observe cells for long time periods while they are exposed to toxins, counteracting drugs, and/or fluorescent compounds. The invention allows for rapid loading of cells grown on thin glass coverslips onto the chamber, followed by easy assembly and sealing. Perfusion with media can then begin, resulting in cells that remain viable and healthy. Fastening and retainer structures are constructed and arranged such that when they are drawn towards one another and contact opposing surfaces of the chamber body, sufficient pressure is provided against the coverslips to seal the internal chamber. A fixed viewing thickness is maintained.

The design and small volume of the chamber (<0.5 ml) provide optimum conditions for a flow-through system. Using biological dyes to test the flow characteristics of the chamber, it was shown that cells can be uniformly exposed to substances contained in as little as 1.0 ml of liquid under constant flow conditions with little dilution, followed by a rapid wash out of the material while maintaining optimum conditions. The narrow depth, lack of miniscus, and use of thin glass coverships result in optimal optics for viewing living cells on an inverted microscope. The design also allows use of high magnification objectives (60X and 100X oil immersion) with a wide scanning area from which to select the cells.

The chamber allows cellular responses to any type of agent to be monitored visually or with an attached apparatus (e.g., videocamera, 35 mm camera). With the assistance of an imaging program, stored information can be recalled, enhanced, and/or analyzed to show statistical as well as visual differences in cellular responses to various agents. The chamber can be used to safely observe, handle, and contain human pathogens or other hazardous substances.

Features and advantages:

- **Can use to study any primary or cultured cell line that grows on glass coverslips**
- **Can mount to any inverted micro-scope by modifying the base plate; chamber needs no modification**
- **Breakage of the coverslips or other parts caused by uneven or over-tightening is reduced**
- **Constructed of autoclavable polycarbonate plastic**
- **Resistant to solvents, acids, and bases, and easily cleaned, assembled and disassembled**

Patent Status

Patent No.: 6,046,806 **Available from:** www.uspto.gov
Issued: April 4, 2000 **Docket No.:** RLD-96.19

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KEYWORDS: dynamic; microscopy; flow-through cell chamber; autoclavable

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